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General Notes.

GEOLOGY AND PALEONTOLOGY.

The Norian Rocks of Canada.—Professor F. D. Adams of McGill College, Canada has published a memoir on the Norian or Upper Laurentian rocks of Canada.[1] This memoir is the result of five seasons' field-work conducted for the Geological Survey of Canada, supplemented by a laboratory investigation of the rocks constituting the Norian series. According to Professor Lawson, two important results of Mr. Adams' work are first, the clear recognition, as plutonic eruptive formations, of rock masses, which, being petrographically and geolographically units, have each an enormous extent. These are the Norian mass, which occupies nearly 1000 square miles; and the Saguenay mass, which is about six times that area. These masses, which may be termed batholites, are characterized by a distinct type of rock known as anorthorite.

The second important result is the immense simplification effected in Archaean geology in the Canadian territory. (Science, May, 1893.)

The Caudal Fin of Ichthyosaurian Reptiles.—In discussing the recent advances in knowledge of the Ichthyosaurian reptiles, Mr. R. Lydekker refers as follows to an important paleontological discovery which confirms Sir Richard Owen's conclusions that the Ichthyosauri possessed a caudal fin.

"From the circumstance that nearly all their skeletons found in the English Lias have a dislocation in the vertebræ of the tail, Sir Richard Owen was led many years ago to the conclusion that the Ichthysaurs were furnished with an expanded fin at the end of the tail, and that the weight of this fin caused the fracture in question. In the present year, there has been discovered in the Lias one of these reptiles, in which the outline of the fleshy parts is completely preserved, and which proves the existence of a caudal fin of still larger dimensions than Owen supposed to be the case. This interesting specimen is described by Dr. Fraas (*Neue Jahrbuch f. Mineralogie,* 1892, pp. 87-90). We already knew that in the paddles the fleshy part was extended much behind the bony skeleton; but the new specimen shows us that, in addition to the tail-fin, the Ichthyosaurs had a triangular fin on the middle of the back, behind which was a crest of horny excrescence compared to those of the crested newt. The tail fin is vertical and nearly symmetrical externally, although the backbone runs downward to terminate in its lower lobe. In this respect the fin has the same general aspect as in the Sharks, except that in the latter the backbone runs into the upper lobe. It shows, indeed, as Dr. Fraas remarks, how closely analagous is the form of Ichthyosaurs to fishes." (Natural Science Vol. I, 1892.)

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[1] Ueber das Norian oder Ober-Laurentian von Canada. Stuttgart, 1893.

New Fossil Fishes from the Upper Lias.—Continuing. his studies of the fossil fish from the Upper Lias of Cement of Vassy of the Youne, M. Sauvage describes and figures three new species; *Leptolepis affinis* Sauvage, *L. antissiodorensis* Sauvage, and *Pholidophorus gaudryi* Sauvage. The first resembles *L. constrictus* Egerton, but differs from that species by having the preopercular strongly striated, a longer body, more numerous vertebræ, and the ventral fins further back. *Polidophorus gaudryi* is very close to *P. bechei* Ag. and *P. onychius* Ag., it has, however, a longer head, and the scales not so elevated and less numerous than either of these species. It may be identical with *P. dorsalis* Ag., but the description of that species is too meager to allow full comparison. (Bull. de la Soc. d'Hist. Nat. d'Autun, 1892.)

Affinities of Ichthyornis.—Dr. R. W. Shufeldt has published a tabular comparison of the anatomical points of *Ichthyornis dispar*, *Rhynchops nigra* and *Sterna macrura* to show that while in some minor characters *Ichthyornis* seems to come nearer the Gulls than it does the Terns, on the whole it possesses more in common with our now existing Rhyncopidæ than with the Sterninæ. This is most apparent in the cranium; in the large skull compared with the rest of the skeleton; and in certain characters in the vertebral chain and pelvis. (Journ. Anat. and Physiol. Vol. XXVII.)

Cretaceous Formations of Mexico.—Mr. R. T. Hill has recently shown that the Mountain Limestone so widely distributed throughout Mexico is the southern continuation of the Comanche Series of Texas, and is therefore of Lower Cretaceous age instead of Upper Cretaceous and Paleozoic, as has been asserted. The author has recognized the three prominent stratigraphic divisions of the Comanche Series in Mexico as in Texas, and is confident that when the whole region is studied more detailed resemblances of horizons will be observed.

The true Upper Cretaceous is characterized by shallow deposits of ferruginous limestones, clays, sand and lignite. The beds occur in the northeastern border States of Chihuahua, Coahuila and Tamaulipas, and are at least 5000 feet thick. The subdivisions of this series are not distinctly differentiated. The Dakota horizon has no true representative, but the Benton shales and clays with the typical *Inoceramus problematicus* and *Scaphites* occur near Juarez and in El Paso, Texas. The chalky beds of the Niobrara sub-epoch are missing, and the whole of the Niobrara. Pierre is apparently represented by thinner ferruginous clays and impure limestones marked by a commingling of the characteristic fauna and the *Exogyra ponderosa* of the Southern States. The Eagle Pass beds, correlated by White with the Fox Hill stage grade into the Laramie, and the latter into the Eo-Lignitic beds of the Southern States, the whole having a unity of littoral lithological features indicating that the Upper Cretaceous and basal Eocene from the Dakota to the Claiborne inclusive was a continuous epoch of sedimentation, without any serious interruption of continuity until toward its close, and deposited at a marine base level now occupied by the eastern masses of the Rocky Mountains and eastern Sierra Madre. (Am. Journ. Sci., Vol. XLV, 1893.)

On a new Musteline from the John Day Miocene.—In striking contrast to the Tertiary formations of Europe, those of North America have yielded but very few mustelines. From the White River beds only the problematical genus, *Buncelunus* Cope, the systematic position of which is quite uncertain, has so far been obtained, and the John Day beds have hitherto yielded no members of the family. For this reason, even scanty fragments are of importance. Among the collections of the Princeton expedition of 1889 is a mandibular ramus containing only $\underline{\text{p2}}$ and $\underline{\text{p3}}$, but displaying the alveoli of the other teeth, which was found in the John Day beds at Silver Wells, Oregon. It is obvious at the first glance that this jaw cannot be referred to any genus of carnivores hitherto known from the John Day, and though the absence of the characteristic teeth renders the framing of a generic definition very difficult, yet it is possible to so define it as to make identification of other specimens easy.

Parietis gen. nov., Dental formula $C_{\overline{1}}$ $P_{\overline{4}}$ $M_{\overline{3}}$. $\overline{\text{p2 and 3}}$ small very low, but relatively thick, massive, obtusely pointed and with a cingulum around the entire crown; enamel coarsely wrinkled. Molar alveoli decreasing in size from 1st to 3rd; $\overline{\text{m3}}$ implanted by a single fang. *P. princeous* sp. nov. Mandible short but thick and heavy, with a larger mental foramen beneath $\underline{\text{p2}}$ and a smaller one beneath $\overline{\text{p3}}$, $\overline{\text{P1}}$ very small and inserted by one root. Size small. Length of molar-premolar series: M. ·032. Length of $\overline{\text{p2}}$, ·005: Width of $\overline{\text{p2}}$ ·003. Length of alveolus of

$\overline{\text{m1}}$ ·007 : of $\overline{\text{m2}}$ ·005. Depth of jaw beneath $\overline{\text{p3}}$ ·010. The character of the premolars suggest those of *Inercytherium*, but *Parietis* was no creodont, the molar alveoli clearly showing the presence of one sectorial and two tubercular molars, and the whole appearance of the specimen is musteline. Of the European genera *Stephanodon* von Meyer, appears to be most like *Parietis* but differs in many particulars, e. g. in having but two lower molars.—W. B. Scott, *Geological Museum, Princeton, N. J.*, May 24, 1893.

The Mammals of the Deep River Beds.—The Tertiary beds of the Deep River, Montana, were discovered by Grinnell and Dana in 1875. These observers recognized two distinct horizons in the formation, which they called respectively "Miocene" and "Pliocene," without attempting a more exact correlation. In 1878, Cope referred the formation to the base of the Loup Fork, but afterward regarded it as a distinct epoch (Ticholeptus beds), intermediate between that formation and the John Day.

The Princeton expedition of 1891 made extensive collections in the Deep River Valley, and the examination of these has brought to light some interesting new forms, upon which the following preliminary notes are founded. A full description, with figures, is in preparation.

The beds contain, as Grinnell and Dana pointed out, two very distinct faunas, the older one of which is equivalent to the John Day, and the newer to the "Ticholeptus beds" of Cope. The lower strata, from a few very small exposures, yielded numerous specimens of the following forms: *Cynodesmus thooides* gen. et. sp. nov.; *Steneofiber montanus* sp. nov.; *Cœnopus* sp.; *Miohippus annectens ?* Marsh; *M. anceps ?* Marsh; *Mesoreodon chelonyx* gen. et. sp. nov.; *M. intermedius* sp. nov.; *Poëbrotherium* sp.; *Hypertragulus calcaratus* Cope.

The upper beds, from which alone Professor Cope's collections appear to have been obtained, contain a very different fauna. The following list is made from a comparison of Professor Cope's material with that gathered by the Princeton party: *? Canis anceps* sp. nov.; *Chalicotherium* sp.; *Aphelops fossiger* Cope; *Miohippus* sp.; *Anchitherium equinum* sp. nov.; *Desmatippus crenidens* gen. et sp. nov.; *Protohippus sejunctus* Cope; *P. (Merychippus) insignis* Leidy; *Merychyus zygomaticus* Cope; *M. pariogonus* Cope; *Merycochœrus montanus* Cope; *Cyclopidius simus* Cope; *C. emydinus* Cope; *C. incisivus* sp. nov.; *Pithecistes brevifacies* Cope; *P. decedens* Cope; *P. heterodon* Cope; *Protolabis* sp.; *Procamelus* sp.; *Blastomeryx borealis* Cope; *B. antilopinus* sp. nov.; *Mastodon proavus* Cope.

Cynodesmus gen. nov.—Dentition like the microdont forms of *Canis*, but with the skull structure of the more ancient genera. Cerebral hemispheres small, not overlapping the olfactory lobes or cerebellum, with fewer and simpler convolutions than any of the recent *Canidæ*. Post-glenoid foramen concealed or absent.

C. thooides sp. nov.—Dentition microdont; deuterocone of $\underline{^{p4}}$ relatively large; face short and cranium long; small frontal sinuses present; mandible non-lobate; size medium.

This genus represents the direct canine ancestor which the John Day beds have hitherto failed to yield. Found by O. C. Mortson in the lower strata.

? Canis anceps sp. nov.—A fragment of mandible containing $\overline{_{p4}}$, $\overline{_{m1}}$ and $\overline{_{m2}}$ agrees well with *C. brachypus* Cope, except for its smaller size and more slender jaw. The lower sectorial is nearly as long as in that species (as 17 : 19), but the depth of the mandible is much less (as 21 : 30.) The primitive character of the sectorial renders the generic reference uncertain. Upper beds.

Steneofiber montanus sp. nov.—This species is most like the *S.* (*Castor*) *peninsulatus* Cope from the John Day of Oregon, but the upper molars (except $\underline{^{m3}}$) have but two fossettes, both of which are anterior to the enamel inflection. In the lower molars the antero-posterior diameter of the crown exceeds the transverse. Found by C. C. Jefferson in the lower beds.

The name *Anchitherium* has been much too extensively applied to American equines. The following table will show the generic distinctions in the Miocene forms of this group which appear to be justified by present knowledge.

I. *Teeth brachyodont.*

A. Conules of upper cheek teeth well-marked; posterior transverse crest not reaching the outer wall; external cusps moderately concave or flattened; anterior pillar of lower teeth distinctly marked.

1. No cement present.

a. Incisors without enamel pits	*Mesohippus* Marsh.
b. Upper incisors with enamel pits.	*Miohippus* Marsh.

2. Cement on cheek teeth.

Posterior transverse crests of upper teeth confluent with the external wall. *Desmatippus* gen. nov.

B. Conules of upper cheek teeth much reduced, and external cusps deeply concave; posterior transverse crest confluent with outer wall; anterior pillar of lower teeth reduced and on one or more teeth absent. No cement; incisors with pits. *Anchitherium.*

II. *Teeth hypsodont.*

1. Antero-internal cusp of upper teeth confluent with transverse crest. *Protohippus* Leidy.
2. Antero-internal cusp separate from transverse crest. *Hipparion* de Christol.

Desmatippus gen. nov.—Molars and premolars short crowned, the valleys more or less filled with a thin deposit of cement. In the upper series the posterior transverse crest is connected with the outer walls and sends forward a process which extends nearly to the anterior conule. Inner cusps of lower teeth expanded so as to narrow entrances to the valleys. Median inner cusps (a, a′ of Rütimeyer) much more distinctly separated than in the older genera.

D. crenidens sp. nov.—Posterior transverse crests of upper cheek teeth sinuous; limbs elongate and slender; size moderate.

This interesting new equine very satisfactorily fills the gap between *Miohippus* and *Protohippus.* The type specimen was found by I. Benet in the upper strata of the Deep River.

Anchitherium equinum sp. nov.—Size equal to that of *A. aurelianense,* but with teeth relatively larger; lower incisors without enamel pits; humerus with bicipital tubercle and double bicipital groove.

This is the first American species of *Anchitherium* in the restricted sense in which that name is here employed. It was found by Mr. Benet in the upper beds.

Mesoreodon gen. nov.—Skull and dentition very much as in the John Day genus *Eporeodon* but with " adaptive " names, the 3d metacarpal articulating with the trapezoid and excluding the 2d from the magnum.

M. chelonyx sp. nov.—Metapodials rather short and stout, ungual phalanges trowel-shaped and pointed.

This is the most abundant animal of the lower beds, and nearly all parts of the skeleton are known. Two very curious features are the presence of a rudimentary clavicle and of an ossified thyroid cartilage of the larynx. The type was found by O. C. Mortson.

M. intermedius.—Metapodials slender and elongate, and ungual phalanges like those of *Merychyus.* Lower beds.

Cyclopidius incisivus sp. nov.—Like *C. simus,* but having two small incisors in each premaxillary; the latter bones also of a different shape from those of the former species. Found by R. A. Stevenson in the upper beds.

Blastomeryx antilopinus sp. nov.—Size decidedly smaller than that of *B. borealis* Cope, and ribs of external crescents on upper molars less prominent. Found by O. C. Mortson in the upper beds.

Besides the new forms here enumerated excellent materials were found of species already named, including some nearly complete skeletons, which will be fully described in the memoir now in preparation.

W. B. Scott.

Geological Museum, Princeton, N. J., June 9, 1893.

Conditions of Erosion beneath Deep Glaciers.—Mr. N. S. Shaler has published a paper on the conditions of Erosion beneath deep glaciers, based upon a study of the Boulder Train from Iron Hill, Cumberland, R. I. The author advances an hypothesis of pressure melting to account for unexplained peculiarities of glacial movement, such as sudden variations of a temporary nature in the position of the ice, and the movement of the ice in the direction of the glacial flow over surfaces of slight inclination. It also accounts for the small amount of erosion often traceable in the central parts of a glaciated district, and explains the phenomena exhibited by drumlins or lenticular hills. (Bull. Harv. Mus. Comp. Zool., Vol. XVI, 1893.)

Paleozoic.—Mr. Whiteaves has published a list of 16 gasteropods found in the Trenton limestone of Manitoba, of which, one *Loxonema winnipegense,* is new. The new species is of interest on account of its close similarity to some of the most typical Jurassic species of *Pseudomelania.* (Can. Rec. Sci. April, 1893).—A new fungus, *Incolaria securiformis,* is reported by Mr. H. Herzer. It was found under the bark of a Sigillaria imbedded in the Zoar limestone of Tuscarawas Co., Ohio and represents a new genus. (Am. Geol. June, 1893). A new fern from the Coal Measures of Henry Co., Missouri, is described and figured by Mr. David White in the Bull. Geol. Soc. Amer., 1893 under the name *Tæniopteris missouriensis.* According to the author the new species presents a striking combination of tæniopteroid and alethopteroid characters.

Mesozoic.—Mr. N. H. Darton has defined a thin series of arenaceous deposits lying between the Potomac and Severn formations, to which he gives the name Magothy formation. Its stratigraphic position places it in the early Cretaceous. (Ann. Journ. Sci. 1893). Mr. P. B. Brodie reports the discovery of fossil fish and labyrinthodonts in the Green Gritty Marls, immediately overlying the Red Marls of the Upper Keuper in Warwickshire. The fish are represented by scales, numerous large and small spines of cestracionts, and the palatal teeth of *Acrodus keuperinus;* the labyrinthodonts, by fragments of bones only. (Quart. Journ. Geol. Soc., May, 1893.)

Cenozoic.—Mr. Lydekker has described and figured three new Cetaceans:—*Zeuglodon caucasicus* characterized by its small size; *?Platanistidæ,* represented by an associated series of four cervical, and the first dorsal, a lumbar, and a caudal vertebra; *Iniopsis caucasica,* which has maxillary fossæ of the Inia type. The fossils in question were found in Eocene strata of the Caucasus Mountains. (Proceeds., London, Zool. Soc., Nov., 1892).—Mr. J. S. Diller has published evidence to show that the Shasta-Chico series in California and Oregon is the result of continuous sedimentation, and that there is a faunal break in Oregon between the Chico and the Tejon. (Bull. Geol. Soc. Am., Vol., 4, 1893.)

Mr. E. T. Dumble reports a bed of Volcanic Dust in Texas. Its stratigraphic position is in the brown-coal series of the Fayette beds, and, if the correlation of these beds be correct, of Miocene age. (Trans. Texas Acad. Sci., 1892.)